In reality, however, there is but little foundation for such a reproach. A correct observation is one thing; the interpretation of it is another. Interpretation must almost necessarily change as new facts become known, and a mere clinging to exploded theories affords no claim to distinction. But no one has ever accused Strasburger of carelessness in observation. His scientific memoirs are repositories of facts many of which as yet cannot be fully utilised. He, no less than others, strove to fit the facts into their place, but unlike many people, he was always ready to reconsider the grouping.

Amongst his many contributions to our knowledge of important problems of wide biological importance, special allusion may be perhaps made to a paper that appeared in the *Biologisches Centralblatt* about twelve years ago, in which he traced the effect of *Ustilago violacea* in causing the normally latent stamens in *Lychnis dioica* to develop within the female flower. In this paper are also detailed many experiments on the possibility of influencing the numerical ratio of the sexes in diœcious plants.

Limitations of space, however, quite forbid any attempt to do justice here to Strasburger's scientific work. That will be more appropriately dealt with in another place. It is rather of the man and of his personality that one would speak, even though briefly.

He was possessed of a singular charm of manner, which also makes itself felt in many of his writings. In controversy he was always a courteous opponent, and set in this respect an example which is unfortunately not always followed.

He attracted to his laboratory students from all parts of the world, and many who have studied at Bonn will recall the respectful affection in which the Geheimrath, as he was generally spoken of, was held. A country walk with him was a delight not easily forgotten; he would talk deeply and lucidly on many subjects—the philosophy of science and of politics, of art and of literature—and there was always abundant food for reflection in what he said.

In his later years Prof. Strasburger was an occasional visitor to this country, where he was always sure of a warm welcome from a wide circle of scientific *confrères*. He was a foreign member of the Royal and the Linnean Societies. His loss will be felt as a very real and a very personal one by those who were privileged to count him as a friend.

J. B. F.

NOTES.

WE are asked to say that Lady Hooker will be grateful if any of her friends who possess letters written by her late husband, Sir Joseph Hooker, will lend them to her for the purposes of a biography which Messrs. Smith, Elder and Co. will publish. The letters, which should be forwarded to Lady Hooker at The Camp, Sunningdale, will be carefully returned.

IT is officially announced that Captain H. G. Lyons, F.R.S., has been appointed assistant director of the Science Museum, South Kensington.

D. STENQUIST, Frejgatan 69, Stockholm, Sweden, asks us to say that he will be glad to receive papers or unpublished observations of terrestrial magnetism and electricity, meteorological phenomena, and optical effects such as halos, luminous night-clouds, auroræ, &c., for the following dates:—1908, June 30 to July 1; 1909, September 25; 1910, May 19.

THE Albert medal of the Royal Society of Arts for the current year has been awarded by the council, with the approval of the president, H.R.H. the Duke of Connaught, to the Right Hon. Lord Strathcona and Mount Royal, G.C.M.G., F.R.S., for his services in improving the railway communications, developing the resources, and promoting the commerce and industry of Canada and other parts of the British Empire.

THE death is reported of Dr. W. McMichael Woodworth, assistant in the Harvard Museum of Comparative Zoology. He had been a member of the teaching staff of Harvard for more than twenty years. His researches were devoted chiefly to the study of worms. Dr. Woodworth was a close friend of the late Prof. Alexander Agassiz, whom he had accompanied on several of his explorations in Pacific islands.

IN the course of his address at the annual general meeting of the Linnean Society of New South Wales on March 27, the president, Mr. W. W. Froggart, reported that the fellowships endowment capital has increased to 40,000*l*. In response to the invitation of the council of the society for applications for two fellowships for the period 1912–13, Mr. E. F. Hallmann and Mr. A. B. Walkom have been appointed. Mr. Hallmann has selected zoology as his branch of study, and will devote his attention particularly to the further elucidation of the characters of the Monaxonellid sponges. Mr. Walkom has been appointed in geology, and will proceed to a detailed study of the stratigraphical relations of the Permo-Carboniferous areas of Australia and Tasmania, with special reference to the palæogeography of that period.

A CIRCULAR letter from Mr. R. T. A. Innes informs us that the Transvaal Observatory at Johannesburg is now renamed "The Union Observatory," and its activities will be mainly of an astronomical nature, but the first-order meteorological observations will be continued, and the observatory will also collect seismological data for the Union. The Natal Observatory at Durban has been closed, and the Cape Meteorological Commission dissolved. On April 1 a new Department of Meteorology was formed in Pretoria, which will embrace the meteorology of the four provinces of the Union (Cape Colony, Transvaal, Orange Free State, and Natal). In future, communications relating to meteorological affairs should be addressed to the Chief Meteorologist, Department of Irrigation, P.O. Box 399, Pretoria, Union of South

Africa, and for astronomical affairs to the Astronomer, Union Observatory, Johannesburg, Union of South Africa.

PROF. P. LENARD, professor of physics at the University of Heidelberg, celebrated his fiftieth birthday on June 7, the event being marked by great rejoicings among his present and past students. Prof. Lenard is best known by his fundamental researches on the kathode rays, in recognition of which he was elected Nobel laureate in 1905; but he has done a great amount of work of the first importance on other subjects, having, in particular, elucidated the various actions of ultra-violet light and the many phenomena of phosphorescence. His publications on the former have been recently augmented by a series of papers describing experiments carried out in collaboration with Dr. Ramsauer, in which the photoelectric action on gases and the chemical effects of the light were clearly distinguished, and attributed to definite groups of wave-lengths. The work on phosphorescence, begun in conjunction with Klatt, and since developed in great detail by Lenard and his students, has greatly added to our knowledge of the mechanism of emission of light by the atom. The new institute of physics now being constructed for Lenard at Heidelberg is rapidly nearing completion, and will put at his disposal greatly increased conveniences of laboratory equipment.

A REUTER message from New York reports that a steamer arrived at Seward (Alaska) on Sunday covered with volcanic dust from an eruption at Katmai, in the Aleutian Islands. It is stated by those on board that a steady stream of volcanic fragments and ash followed a terrific explosion, spreading over the countryside. The sun was obscured. Although the vessel was seventy miles distant, at four o'clock on Thursday afternoon complete darkness set in and ash fell in a thick layer on the decks. It is estimated that volcanic ash covers three hundred square miles of fertile country. According to a telegram from Seattle (Washington State) the volcanic disturbance is rendering wireless telegraphic communication with Kadiak, Rospberry, and Afognac, three of the most important islands of south-western Alaska, impossible.

SIR WILLIAM WILLCOCKS lectured before the Royal Geographical Society on June 10 on "The Garden of Eden and its Restoration," a title which will be easily understood as referring to the great work which he has been planning at the request of the Turkish Government—the regulation of the lower Euphrates and Tigris and the use of their waters to restore the former fertility of the territories through which they flow, the now desolate seat of some of the oldest known civilisations. He explained the difficulties of raging floods with which the ancient engineers had to contend, contrasting them with the regular and comparatively gentle rise of the Nile, and remarking that Egypt, where everything was made easy, "produced no world ideas." He placed the original home of the inhabitants of Sumer and Akkad in Arabia, close at hand. He described his discovery of a depression in the desert, containing Euphrates shells, just as the limits of the ancient lake Moeris are marked by Nile shells. He designed the Habbania escape to carry the overflow of the Euphrates into this depression. He also detailed schemes for the more difficult regulation of the Tigris, which the ancient engineers never completely effected, and showed that the delta of the two rivers, once the works were completed would be a richer agricultural region than Egypt or the Sudan, adding, among other proofs, comparative analyses of the soils in the three areas.

THE flight round London, the so-called "Aërial Derby," of eighty-one miles for a gold cup presented by *The Daily Mail*, and cash prizes of 250*l.*, 100*l.*, and 50*l.*, given by Mr. Harold Barlow, took place without serious mishap on June 8. The starting and finishing points were the London Aërodrome at Hendon, and the course lay over Kempton Park, Esher, Purley, Purfleet, Epping, and High Barnet. Although fifteen machines had been entered, only seven went to the starting line, and only five completed the course. The official results were given as follows:—1st, G. Hamel (and passenger, Miss Trehawke Davies), 70-h.p. Gnome Blériot monoplane, time 1h. 38m. 46s.; 2nd, W. B. R. Moorhouse, 50-h.p. Gnome Radley-Moorhouse monoplane, time, 2h. 0m. 22s.; 3rd, J. Valentine, 50-h.p. Gnome Bristol monoplane, time, 2h. 26m. 39s. T. O. M. Sopwith, on a 70-h.p. Gnome Blériot monoplane, was the first to return, but was disqualified for having turned a considerable distance inside the Purley mark, having missed his course; P. Verrier, carrying a passenger on his 70-h.p. Renault M. Farman biplane, got lost in the clouds over Esher, and did not complete the course; S. V. Sippe (50-h.p. Gnome Hanriot monoplane) also missed his way; and M. Guillaux (45-h.p. Anzani Caudron monoplane) was robbed of the first prize by running out of petrol, and being compelled to descend only four miles from the finish. The outstanding features of the race were the awakening interest of the general public, who turned out in vast numbers all along the route, the extraordinary speed of a comparatively low-powered monoplane (the Caudron), showing very great efficiency in design; the fact that not a single British motor competed, the fact that the successful pilots steered more by the course indicated by the crowd of spectators than by maps and compass; and, finally, the urgent necessity for more delicate and precise instruments for aërial navigation. Methods for instantly determining the speed over land, the speed of the wind, and the amount of drift on an aëroplane have long been desired by the aviator, and until they are forthcoming it is impossible to reduce aërial navigation to an exact science.

THE President of the Local Government Board has authorised the following special researches to be paid for out of the annual grant voted by Parliament in aid of scientific investigations concerning the causes and processes of disease:—(1) Further investigations (*a*) as to the distribution of tubercle bacilli in children having died between the ages of two and ten years, and the special characteristics of such bacilli; and (*b*) in collaboration with the general register office, on the incidence of different forms of tuberculosis in different parts of the country, according to age, sex, occupation, and other conditions. (2) A continuation of a research into the causes of premature arterial degeneration in man by Dr. F. W. Andrewes, of St. Bartholomew's Hospital. (3) A joint investigation into the virus of Poliomyelitis, by Drs. F. W. Andrewes and H. M. Gordon, of St. Bartholomew's Hospital. (4) A continuation of an investigation into the micro-organisms known as non-lactose fermenters occurring in the alimentary canal of infants, by Dr. C. J. Lewis, of Birmingham University, Dr. D. M. Alexander, of Liverpool University, and Dr. Graham-Smith, of Cambridge University. (5) A continuation of the investigation by Prof. Nuttall, of Cambridge University, on fleas and on the range of flight of the domestic and allied flies.

IN the twelfth Bulletin of the Bankfield Museum, Halifax, Messrs. H. P. Kendall and H. Ling Roth, the honorary curator, publish a catalogue of an interesting exhibition, now open, of prehistoric implements collected in the neighbourhood of the city. They are found under a layer of peat, associated with remains of the Bronze age. But the implements of that metal hitherto brought to light are small and fragmentary, and it is thus obvious that the age of stone overlapped that of bronze. The period assigned to these specimens is about 500 B.C. Some of the arrow-heads are fine examples of secondary chipping. Of special interest are the so-called "pygmy" flints, found in considerable numbers. Mr. Ling Roth dismisses the theory that these were fixed together in a handle and used like the implement found by Dr. Livingstone among the Makalolo for the destruction of the inner tissue of hides. While admitting that some of them may have been used for the purpose of tattooing, he urges that their great numbers show that this cannot have been their only object. Many uses may be conjectured for these curious implements, but no single explanation yet suggested accounts for their special forms.

THE proprietors of *The Bioscope* have promoted some educational kinematograph demonstrations which are given at Cinema House, 225 Oxford Street. That on medical subjects (June 5) included amœboid movements of leucocytes, trypanosomes and spirochætes in the blood, examination of the stomach under X-rays, and the life-history of the mosquito. The movements of the spirochætes and trypanosomes were vividly portrayed, and the study of the mosquito outlined in a few minutes the life of the insect. The movements of the larvæ and the effects of petroleum as a culicide were shown, and the final scene, the emergence of the perfect insect from the pupa, demonstrated the capabilities of the kinematograph for reproducing biological phenomena.

A COPY has been received of the report to the trustees of the Indian Museum on zoological and anthropological work undertaken during the Abor expedition of 1911–12, written by Mr. S. W. Kemp, the senior assistant superintendent of the museum. Reference has already been made in these columns (June 6, p. 365), in our report of the meeting of May 1 last of the Asiatic Society of Bengal, to two papers upon specimens collected during the expedition, and other papers will no doubt be presented to the same society shortly. The report just received gives a brief account of what was accomplished by Mr. Kemp as zoologist and anthropologist to the expedition, and by his assistant, Mr. R. Hodgart, the zoological collector in the Indian Museum.

A SATISFACTORY year's work and progress are recorded in the report of the Zoological Society of Philadelphia for 1911, the receipts from admissions having shown a considerable increase over those of 1910, despite an unfavourable winter and an unusually large number of wet Sundays in the summer. Attention is directed to the increasing cost and difficulty of obtaining living specimens of representative wild animals, due, it is surmised, in great part to diminished supply, protection of faunas, and restrictions on importations of livestock of all kinds. Further experiments in outdoor life for monkeys and carnivores were successfully instituted.

IN the concluding portion of the report of Prof. H. F. Osborn's Harvey lecture, published in the May number of *The American Naturalist*, it is argued that the occurrence of discontinuity in heredity in three widely sundered families of mammals is not to be regarded as evidence of discontinuity of origin. If discontinuities in origin do exist, they must be so minute as to be indistinguishable from those fluctuations round a mean which appear to accompany every stage in the evolution and ontogeny of unit characters. The principle of predetermination, of which the author finds evidence, is in direct opposition to the views of Bateson, de Vries, and Johannsen, and there seems to be "an unknown law operating in the genesis of many new characters and entirely distinct from any form of indirect law which would spring out of the selection of the lawful from the lawless."

IN the course of the above-quoted Harvey lecture, Prof. Osborn records some very interesting comparisons between the skulls and cheek-teeth of horses, mules, and asses. The tendency of these is to confirm the view that the mule is generally only a partial blend of the characteristics of its parents, most of its features inclining to one or the other type. In skull-characters mules assimilate in the main to horses (which are a polyphyletic type), whereas in the pattern of their cheek-teeth, as well as in external features and disposition, they are more like the monophyletic ass, thus showing that the ass-like characters are displayed by epiblastic structures. Several of the horse-like features recorded by the author as occurring in the mule are, it may be observed, much less apparent in the wild Mongolian tarpan than in domesticated horses, thus suggesting that they are derived from an Arab source.

IN the Bulletin of the St. Petersburg Botanical Garden (xii., 1), Dr. V. Arcichovskij describes various objects—some well known, others new—

which are suitable for the study of the anatomy of plants with the naked eye. Teachers of botany know that a good deal of "histology" can be done without the aid of the microscope if suitable material be selected, as, for instance, the stems of cucumber, marrow, balsam, or begonia, in which the cells and vessels are readily seen. The author gives measurements of the large parenchyma cells in the stems of these and other plants, but the largest sizes are apparently attained in the leaves of various succulents, such as Echeveria, Kleinia, Crassula, and Aloe. The nucleus can be seen with a lens magnifying ten diameters, or even with the naked eye, in the cells of the arbutus fruit; the protoplasmic streaming in the elongated cells of the stonewort Nitella is readily observed in the same way. The leaves of various conifers and succulents show the distribution of the stomata well without microscopic aid, especially after the waxy 'bloom" has been removed.

THE last number of the *Bollettino* of the Italian Seismological Society (vol. xv., No. 12) is devoted to notices of the earthquakes recorded in Italy towards the close of 1908. The interest of these notices naturally centres in the Messina earthquake of December 28. The present number contains a summary of all the instrumental records, the personal observations, which are very numerous, being reserved for one of the special *Annali* to be issued shortly by the Meteorological and Geodynamic Office of Rome. As a rule, the instrumental records in all parts of the country are incomplete, seismographs having been thrown out of action by the violence of the shock, or the writing-pens swung off the drums or caught by some other part of the apparatus. For so strong an earthquake, the recorded after-shocks are few in number, but this, it is suggested, may be due to the fact that they were practically confined to the most strongly shaken regions, and therefore escaped registration owing to the want of observers.

THE "New Method of Weather Forecasting," published by M. G. Guilbert (Paris, 1909), has again been brought to the special notice of meteorologists by the publication of a critical study of the question by Heer P. H. Gallé in the *Mededeelingen* of the Royal Netherlands' Meteorological Institute (No. 12, 1912). Guilbert's rules depend upon three principal ideas:—(1) normal wind; (2) region of least resistance; and (3) convergent (or divergent) winds. Our readers will find a very lucid statement of the method by one of our leading meteorologists in NATURE, vol. lxxxii., p. 271 (1910). It is there explained, *e.g.*, that, after a careful scrutiny of the daily weather charts, Guilbert found that if the wind force is in excess of the normal for the gradient, a surge of high pressure in the direction of the gradient may be expected, and *vice versâ*, and that any wind which has a component directed away from a centre of low pressure marks a region of low resistance to its advance. Heer Gallé applied these principles to the prediction of the chief meteorological elements for various districts, and has given the results for each case. The general conclusion arrived at is that while the method in question may not be expected to revolutionise the meteorological service, it may promote the progress of weather prediction and, especially, may lead to an improvement of storm warnings.

AN important article on "Modern Uses of the Metal Aluminium," by Dr. R. Seligman, appears in the April issue of *Science Progress*. The sudden demand for the metal in 1905 was due to the requirements of the motor-car industry; but as additional supplies were not forthcoming sufficiently quickly, the industry turned to the use of thin steel sheets and frames of special steels, which were often found actually to be lighter than aluminium parts of equal strength. The increase of output from 9000 tons in 1905 to 34,000 tons in 1910 resulted in a fall in price to about one-half, and brought back a certain amount of the earlier demand for aluminium in motor-car work. But other uses were required to consume the enlarged supply, and in this country a very important outlet has resulted from the discovery of methods whereby, with the help of a special flux, sheets of aluminium may be fused together without the use of any extraneous solder. Vessels made in this way are of special value for chemical industries, and most of all in those involved in the manipulation of food materials. The metal is not only entirely non-poisonous, but resists corrosion in a way that is in many respects remarkable, and has the further advantage that it imparts no coloration to the materials in contact with it. In the brewing industry, fermenting tanks up to 30,000 gallons have been constructed, and pressure vessels for fermenting up to 45 lb. per square inch have been made of 1800 gallons' capacity; the metal has here the special advantage that it can easily be kept clean from bacteria, and is as innocuous to yeast as it is to the human stomach.

IN studying the hydrolysis of salicin by emulsin, MM. Bourquelot and Bridel have been able to show that the action goes on in strong alcoholic solutions, but that the hydrolysing action stops when about a half of the salicin has been acted upon. It seemed possible that this might be a reversible reaction, and in the *Comptes rendus* for May 20 they describe an attempt to synthesise salicin from saligenin and glucose by the action of emulsin in alcoholic solution. The change was followed by measuring the changes in the rotatory power of the solution, and after twenty-four days the optical properties of the liquid were exactly those which would be expected for the equilibrium with 55 per cent. of salicin. But in spite of this coincidence the glucoside formed was found, after extraction and purification, to be different from salicin. This shows that conclusions previously drawn as to the reversible action of emulsin are unsound.

AN exhaust-gas calorimeter for internal-combustion engines, in use at Glasgow University, is described by Messrs. Nicholson and Morley in *Engineering* for May 31. The principle of the apparatus lies in the transfer of heat from the exhaust gases into a water jacket surrounding the exhaust pipe. To ensure rapid cooling, the exhaust gases are led through Serve tubes. The water jacket is formed by the space between the Serve tube and an external tube of slightly greater diameter; the annular space is kept small in order to obtain a high velocity of flow in the circulating water. Thermometers are inserted in suitably packed pockets. The whole apparatus is exceedingly simple and inexpensive to construct, being built up of standard pipe fittings, and should prove a useful addition to the testing appliances of an engineering laboratory or of a works' test plate; the otherwise troublesome operation of determining the heat wasted in the exhaust gases may be easily performed by its use.

We learn from *The Engineer* for June 7 that rapid progress is being made with the leviathan dock at Liverpool, and that it is hoped to complete the work in the summer of 1913. This dock is 1020 ft. long —nearly 140 ft. longer than the *Olympic*—and has an entrance 120 ft. wide. The structure of the dock is to be such that it will be available when required as a graving dock for overhauling and repairing the largest steamers likely to be met with for some years. The entrance will be provided with a sliding caisson having a clapping face on each side, so as to maintain the water in the dock or exclude it therefrom according to the duty required. The caisson is 134 ft. in width. The dock walls are 60 ft. high, and are practically complete. For emptying the dock, five sets of centrifugal pumps with Diesel engines will be installed. These will be capable of emptying the contents of the dock, amounting to about seven million cubic feet of water, in two and a half hours.

Several new editions of scientific works have been received recently. These include a second edition of Prof. A. G. Webster's "The Dynamics of Particles and of Rigid, Elastic, and Fluid Bodies," published by Mr. B. G. Teubner, of Leipzig, and Messrs. Williams and Norgate, in London, at the price of 14*s*. net. This edition is substantially identical with the first, except that a few errors have been corrected. —A second edition of Prof. E. C. C. Baly's "Spectroscopy" has been issued by Messrs. Longmans, Green and Co., at the price of 12*s*. 6*d*. In it Prof. Baly has given a *résumé* of the salient points of the more modern work, and has provided useful lists of references.—Messrs. Hazell, Watson and Viney, Ltd., have issued a ninth edition of "The Dictionary of Photography," by Mr. E. J. Wall, which has been edited by Mr. F. J. Mortimer. The book has been completely revised and brought up to date, and nearly a hundred pages of new matter have been added. The price of the new edition is 7*s*. 6*d*. net.—A sixth edition of Miss M. N. Oxford's "Handbook of Nursing" has been published by Messrs. Methuen and Co., Ltd., at the price of 3*s*. 6*d*. net. This work has been entirely revised, and in the work of revision the author has had considerable expert assistance.—From the same publishers we have received a copy of the ninth edition of Sir Oliver Lodge's "Man and the Universe," which can now be obtained at 1*s*. net.

OUR ASTRONOMICAL COLUMN.

Nova Geminorum No. 2.—The more salient features of two series of spectrograms taken at the Pulkowa Observatory (March 15–18 and March 25 and 26) are described by Dr. Tikhoff in No. 2, vol. v., of the *Mitteilungen* of that observatory. The scale was small, 6·3 mm. from $H\beta$ to $H\epsilon$, but the negatives clearly disclose the extraordinary changes which took place in the spectrum of the nova. By employing different plates and filters, Dr. Tikhoff secured negatives giving the whole spectrum from $H\alpha$ to $H\eta$, and he states that on March 15 the characteristic feature was a series of intense absorption lines, both broad and narrow, the bright lines being but little brighter than the intense continuous spectrum. He classifies the spectrum as lying between types F and G. On March 16 the continuous spectrum generally had diminished considerably in brightness, except in the ultra-violet, where it was brighter and extended to about $\lambda 3600$; the absorption bands of hydrogen were scarcely visible on this date, although H and K were very strong and the bright bands of hydrogen very intense. The striking features on March 25 were the reappearance of the absorption bands and the strong continuous spectrum.

During the two periods of observation two analogous series of changes occurred in the spectrum, such as might be produced, Dr. Tikhoff imagines, by the shattering of successive absorbing envelopes by fresh outbreaks of incandescent gases from the central mass.

Prof. Belopolsky, in the same *Mitteilungen*, gives, in great detail, the measures of the structure of the various H, Ca, He, and N (?) lines, from which he deduces the radial velocities and possible physical conditions of the emitting masses.

The Minor Planet 1911 MT.—From a note in *The Observatory* (No. 449, p. 243) we learn that the elements for the orbit of the exceedingly interesting asteroid 1911 MT., calculated by Messrs Haynes and Pitman, are, as shown by the observations, fairly accurate. The planet has a period of about 2·6 years, while its perihelion distance is about the same, 1·15, as that of Eros, but the eccentricity of the orbit is nearly twice as great. The next opposition will take place in March, 1913, but the planet's magnitude will then be 17 or 18; most of the oppositions take place when the planet is near aphelion, and are therefore unfavourable for observation. According to amended elements published by Prof. Franz, in No. 4575 of the *Astronomische Nachrichten*, the orbit is like that of Eros, but the planet approaches even nearer the earth than does the famous object discovered by de Witt.

The Spectrum of P Cygni.—Discovered by Janson in 1600 and observed as a third-magnitude star, by Cassini, for a short period in 1655, the star P Cygni has for more than 230 years remained at nearly constant magnitude, 5·0, and its spectrum still requires adequate explanation. Prof. Frost, dealing with it in a paper published in No. 4, vol. xxxv., of *The Astrophysical Journal*, offers some interesting points for consideration.

Among other things he finds that in recent years the spectrum has remained practically constant, that the apparently large displacements of the dark companions to the bright lines are spurious, being produced by the obscuration of their less refrangible portions by the bright lines, and that there is a difference of 70 kms. between the radial velocities of the dark- and bright-line systems. The lines of H, He, O, and N are represented both as emission and absorption, while Ca and Si present dark lines only;